

# Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

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Vol. 2

September, 1900

No. 21

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## THE FERNS OF ALSTEAD, NEW HAMPSHIRE.

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FOR several weeks I have watched with interest the ferns occurring within a five-mile radius of the Alstead School of Natural History. Besides Alstead itself this region embraces portions of several other towns, though with few exceptions the species here enumerated have all been collected within the limits of Alstead township. Notwithstanding the fact that there is little or no limestone in the immediate vicinity of Alstead, the natural conditions of the region — naked and wooded hills, exposed and sheltered cliffs, upland and lowland woods and swamps — are favorable to the development of very many species, and the unusually complete representation of many genera has furnished a good opportunity for study. To those familiar with the limited region which I have examined, the following notes may be of interest, while to others they may furnish data for some profitable comparisons.

There is hardly a pasture or roadside, wet or dry, from which one does not get, as he walks or rides, the fragrance from the damp or almost viscid fronds of the sweet-scented fern, *Dicksonia pilosiuscula*. The stone walls marking the boundary lines of the hillside farms, and the boulders, often lodged in deep hollows, are banked on either side by beds of the delicate, minutely pubescent fronds; and where the walls or fences have been destroyed the boundaries are now marked by broad belts of *Dicksonia*. Wherever the plant grows, the fronds show a decided tendency to turn in one direction. Sometimes it seems that the fruit-bearing surfaces are all turned from the light. This characteristic is particularly noticeable where the fern grows in a ravine, with the intenser light entering from one direction. Other observers have remarked the tendency of the fronds to face the

prevailing wind of the region, and in evidence have pointed out large patches in the open where the light is essentially uniform from all directions.

Often mixed with the *Dicksonia*, but as frequently growing by itself, is the lady-fern, *Asplenium Filix-fœmina*, easily distinguished from the other by its stouter, smoother, and more succulent fronds. Along the roadsides and in open places the fronds are now (early August) brownish and straggling from the weight of the fruit; but in spite of the unattractive appearance of this fern, its soil variations are striking and exceedingly baffling. I find it difficult to reconcile as forms of the same species the plant of the dry roadsides and of the wooded swamp not a hundred yards away; yet the diverse forms are so numerous and inconstant that it seems almost hopeless to attempt any definite characterization of them.

In rich, shaded soil, especially in alluvium, I have occasionally found the rarer *Asplenium thelypteroides*. In order to distinguish this fern, at first sight, from the ostrich-fern, one must have a long acquaintance with the plant. In the ostrich-fern, however, the pinnae are firmer, more crowded and more over-lapping than in the more herbaceous frond of the *Asplenium*; and, furthermore, if the *Asplenium* is in fruit all doubt as to its identity will be removed, for an examination of the under side of the frond will reveal the elongated fruit dots characteristic of the genus.

Other representatives of this genus here are *Asplenium ebeneum* and *A. Trichomanes*, often found side by side on shaded, moss-grown rocks. The ebony fern, *A. ebeneum*, is the taller and more upright of the two plants, with a smooth, stout, black stipe and rhachis, while *A. Trichomanes*, the smaller of the two, occurs in dense spreading tufts, a few green fronds often rising from a mass of dead, brown stems, the remnants from many previous years.

Most interesting to me of the Alstead *Aspleniums* is a bed of *A. angustifolium*, at what may be its easternmost station. The only patch found was by the course of a spring brook, in rich, alluvial woods near the Cold River, only a few miles from its junction with the Connecticut. So closely did the plant resemble, at first sight, the Christmas fern, that it was not until I had passed my hand over the fronds and examined them more carefully that I noticed the difference. The fronds are longer and more spreading, and of such delicate texture that they wilt as quickly as the maiden-hair, *Adiantum pedatum*, a

plant which abounds here as in all the rich woods of western Cheshire County. At this time, early in August, the fruiting fronds of the *Asplenium*, with elongated, crowded dots, are just appearing.

On a shaded hillside I have once found fruiting fronds of the brake, *Pteris aquilina*, a plant common in every clearing, but, in my experience, rarely fruiting. Nor have I seen the plant so tall and broad as here in the woods, where the fruiting plants are conspicuous by their more straggling-branched appearance, caused by the infolding of the margins to cover the spore-cases.

In a few places the rock-fern, *Polypodium vulgare*, covers the ledges. In the shade the fronds are long and green, while in the sun they are stunted and yellowish; but nowhere here have I seen the plant in such abundance as in eastern Massachusetts.

The two common species of *Phegopteris*, *P. polypodioides* and *P. Dryopteris*, are seen in their respective habitats. Beds of the former are growing in the lee of many dry banks. The fronds are triangular in shape, peculiarly roughened, and almost, if not quite, invariably the two lower pinnae are pushed forward and upward from the rest. I have searched carefully for the broader fronds of *P. hexagonoptera*, but evidently it is not found in this immediate vicinity. *P. Dryopteris*, with its more delicate, thrice-divided fronds, spreads in waving carpets over large areas of damp woods.

I am most pleased that this year the *Aspidiums* have been spread before me for study as never before, — for I found some time since that the secret of careful determination lies in careful comparison. *Aspidium noveboracense*, with its pale fronds attenuated at base, here, as in all New England, is frequent in the borders of woods, while in the deeper shade is the common *A. spinulosum* var. *intermedium*. The low, light-green fronds of *A. Thelypteris* had often attracted my attention in the meadows and swamps, but in the alluvial soil of Cold River I was surprised to find the sterile fronds two feet high, while the more slender, fruiting fronds were even taller.

*Aspidium cristatum*, one of the evergreen ferns, I see frequently in swamps, where its fertile fronds, with large, closely-crowded fruit-dots, are now mature. On the hillsides, *A. marginale* appears in characteristic form. The fronds rise symmetrically from the crown, the fertile ones often falling heavily back, some of them borne quite to the ground by the weight of the large, marginal fruit-dots.

Another evergreen, striking by virtue of its shining fronds, is the

Christmas fern, *Aspidium acrostichoides*, in texture resembling *Polypodium vulgare*, but with the fronds longer and more deeply cut. On the slope of Fall Mountain, in Walpole, I found a single clump of the variety *incisum*, with the pinnae curiously cut and crisped, but hardly so attractive as in the type.

The Woodsias are represented here by two species. *W. Ilvensis* is found in patches on exposed rocks and cliffs. As the elevation and exposure to sunlight increase the plant becomes very stunted and chaffy, but in shaded places the green fronds rival in length those of its scarcer relative, *W. obtusa*. The latter species has thus far been found only on the slopes of Fall Mountain, but there it grows on an earthy bank with *Cystopteris fragilis*, a species which loves best the dripping, shaded rocks by streams.

All three of the Osmundas grow here. The flowering fern, *O. regalis*, with only the tips fertile, is stunted and yellow in dry soil, but tall and green in the swamps. The interrupted fern, *O. Claytoniana*, is more frequent here than the cinnamon fern, *O. cinnamomea*, and it apparently fruits somewhat later. The sterile fronds of these two species are not readily separated at a glance, but in the cinnamon fern there is a tuft of wool at the base of each pinna, while the pinnae of the interrupted fern are naked at base.

I came from a region where one plant of the ostrich fern, *Onoclea Struthiopteris*, was a carefully protected garden treasure, and, naturally, it has been a constant revelation to me to see, even along the roadsides, the rank profusion of this splendid fern. It is in the alluvial soil of the river banks, however, that the plants become tropical in their size and royal bearing. On the deep, black alluvium near the Connecticut I found one day half an acre of these ferns. The great crowns, with the slightly overlapping fronds, rose to the height of several feet, and it seemed a pity to brush through such a luxuriant growth. Each frond is a perfect production in itself, in form like the feather from which it so aptly takes its name. From the centre of the crown come the thick, twisted fruiting fronds. These are not generally found; but even more of a surprise was the discovery by one member of the school who found, in place of fruiting fronds, a nest of the Maryland yellow-throat — truly a royal home for the young songsters.

Growing beside these plants, — indeed often mingling with them — are the broad, more herbaceous fronds of the sensitive fern, *Onoclea*

*sensibilis*. Here in the deep soil its fronds greatly exceed in size those which we ordinarily see in the meadows, and they appear like the basal leaves of some flowering plant. When the first frosts of autumn come the sterile fronds blacken and shrivel, and only the stiff fruiting fronds remain, brown and torn.

My attention has been drawn, likewise, to a group of fern-allies, the *Ophioglossaceae*, which here present a very fair display of species. Within a mile of the school I find four species of *Botrychium*, the moonwort. *B. virginianum* is most common, its platform-like sterile portion often a foot and a half wide, most exquisitely cut, and, with the long-peduncled fruiting frond, raised high above the other herbaceous vegetation of the dry woods. Not so attractive a plant, but one fully as interesting to find, is *B. matricariaefolium*, which occurs frequently among the leaves under deciduous trees. Its sterile pinnae are small, but coarse and of thick texture, the fruiting portion being the conspicuous part of the plant. Not far from this species, but mostly among pine needles, I found, by searching on hands and knees, the tiny plants of *B. lanceolatum*. In some places only the fruiting tips appeared, while below, half covered, were the finely-cut sterile pinnae. So frail are these two species that I was moved by an impulse to tiptoe over the pine needles lest I should crush one plant.

*Botrychium ternatum*, with its many varieties, does not appear so commonly in this region as in localities near Boston. A single form has thus far been noted, the variety *intermedium*, which rarely grows in open pasture lands.

One hot morning, after studying the plate in Gray's Manual, I hunted in a sunny meadow for the adder's-tongue, *Ophioglossum vulgatum*, and for some time the closest search did not reveal the smooth, oval leaf and the uncanny green fruit-stalk. But when I discovered at first one, then another, and another, among the tall meadow grass, my delight was keen indeed. Further exploration has shown the plant to be not uncommon in meadows and damp fields, where its characteristic yellow roots are deeply buried in the sod.

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